CORRELATION OF PRIMARY SECOND MOLAR OCCLUSAL TYPE TO SOFT TISSUE FACIAL PROFILE USING PHOTOMETRIC ANALYSIS

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DECLARATION BY THE CANDIDATE

I hereby declare that this dissertation titled **"CORRELATION OF PRIMARY SECOND MOLAR OCCLUSAL TYPE TO SOFT TISSUE FACIAL PROFILE USING PHOTOMETRIC ANALYSIS"** is a bonafide and genuine research work carried out by me under the guidance of **Dr. V. Nilaya Reddy, M.D.S., DNB.,** Professor, Department of Paedodontics and Preventive Dentistry, Ragas Dental College and Hospital, Chennai.

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Date: 22.12.16

Place: Chennai

CERTIFICATE

This is to certify that this dissertation titled **"CORRELATION OF PRIMARY SECOND MOLAR OCCLUSAL TYPE TO SOFT TISSUE FACIAL PROFILE USING PHOTOMETRIC ANALYSIS"** is a bonafide record of work done by **Dr.S.BHUVANESSWARI,** under my guidance during her postgraduate study period between **2014-2017**.

This dissertation is submitted to **THE TAMILNADU Dr. M.G.R. MEDICAL UNIVERSITY**, in partial fulfillment for the degree of **Master of Dental Surgery in Branch VIII – Paedodontics and Preventive Dentistry**. It has not been submitted (partially or fully) for the award of any other degree or diploma.

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ABSTRACT

Aim and Objective:

To correlate the molar relationship with soft tissue profile in 4 – 5 yr old children in Chennai.

Material and methodology:

Profile photographs and impressions were made from 474 school going children of 4-5 age group of Chennai. Soft tissue profile measurements were made from the photographs. Terminal plane were analyzed from the casts made.

Results:

Out of 474 children, 257 had straight profile (mesial step 31.90%, distal step 5.83%, flush 160%), 200 had convex profile (mesial step 1%, distal step 71%, flush 28%), 17 had concave profile (mesial step 52.94%, distal step 11.76%, flush 35.29%). Significant difference is seen in nasolabial angle between boys and girls ($p<0.005$). There is significant correlation between the soft tissue profile and projection of upper lip and lower lip to chin. Total facial convexity angle, nasal tip angle showed significant difference between4 and 5 year age group children. ($p=0.000$)*** Significant correlation is seen between molar occlusal type and soft tissue facial profile. ($p= 0.000$)***

Significant correlation is seen between molar occlusal type and soft tissue facial profile angles. (facial convexity angle p=0.000 and total facial convexity angle p=0.000)***

Conclusion:

Findings of this study may be used as a clinical reference for assessing the normal norms of soft tissue profile and as the relationship between the soft tissue profile and primary occlusion is important for orthodontic diagnosis and treatment planning in pediatric dental patients.

KEY WORDS:

SOFT TISSUE PROFILE ANALYSIS, PRIMARY MOLAR OCCLUSAL TYPE, PHOTOMETRIC ANALYSIS.

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Introduction

INTRODUCTION

Facial profile plays a major role in the esthetic appearance of the child, which will be influenced by a number of variables, including skeletal relationships, dental positions and soft tissue thickness and function, which concludes the information that skeletal and dental abnormalities can be derived from soft tissue architecture and has a profound effect on treatment plan. No treatment plan can be complete without consideration of patients' profile.[1]

Profile analysis is considered a vital diagnostic technique to provide dental care to patients.[2] In general, soft tissue analysis relies on angular, linear, or planar measurements or combination of the three.[3] Methods such as anthropometry, photometric analysis, cephalometry, 3-D photometry have been used to identify and classify soft tissue parameters.

However, the use of facial photography for this purpose fell out of favour, with introduction of radiographic analysis and reotenographic cephalometrics.[4-7] The recent resurgence of facial photography has been brought about in part by improvements in imaging tools, which have made soft tissue imaging easier and eliminated worries about associated radiation exposure. There are special areas of concern that must be assessed in the photographic evaluation: profile form (straight or convex or concave), facial proportion, lip size, lip position, nasolabial angle and mentolabial sulcus.

The profile can be analysed by looking at three points: (1) the bridge of the nose, (2) the base of the upper lip and (3) the chin. Once identified, these three points are connected with straight lines to form a complete drawing of the child's profile, which may be concave, straight and convex.[2]

A straight profile indicated when all the three points are at the same level and form a straight line. If the midpoint is anterior, the patient has a convex profile; if the midpoint is posterior, the patient's profile is concave. Dalci et al, defined facial profile based on the facial convexity angle, formed by soft tissue Glabella, Subnasale, Pogonion.[8] Each of these three profiles can be caused by abnormalities of one or two or three point combinations. Convex profile can result from maxillary protrusion, mandibular retrusion, or combination of both. Mild retrusion of the mandible which result in convex profile before puberty is considered normal, since it will catch up to the maxilla with cephalocaudal growth later.

A well-balanced profile usually indicates the presence of a normal or Class I occlusion. An underlying normal skeletal relationship that has no skeletal discrepancy in the antero-posterior relationship, molars and canines with a normal relationship, and primary second molars with a terminal plane that is flush or has a mesial step can be considered normal. But some children may have normal basal bone relationships but disturbed profiles. These situations may be due to abnormal inclination of the incisors such as that resulting from abnormal, non-nutritive oral habits. Correction of incisor protrusion will improve the profile.

Children with a severely convex profile usually have a class II malocclusion and those with a straight or concave profile can have class III malocclusion. The clinical and para clinical examinations can clarify the exact type of malocclusion, whether it is the result of dental or skeletal factors (or a combination of both) or the result of maxilla mandibular or dental discrepancies.

The sagittal relationships of dental arches were described according to the terminal plane relationship of the maxillary and mandibular primary second molars and the relationship of the primary canine teeth.[9,10] A significant relationship between primary occlusion and the soft tissue profile exists.[8]

The morphology of the patient's profile is also another important area that can change the treatment plan. For example, tooth extraction can be considered in children with convex profile if other analysis confirm extraction, while extraction should be avoided in children with a straight or concave profile.

Identifying the characteristics of the soft tissue profile and relating it to molar relationship in 4-5 year old children, can provide useful prognostic and diagnostic criteria, which allow either intervention or monitoring. The reasons to advocate early treatment are better stability, reduction in percentage of extraction of permanent teeth, reduction in overall treatment time and better functional or esthetic end results.

Through the repeatability test, it was found that the linear and angular measurements useful for characterizing facial morphology can be reliably measured from facial photographs,[4,11-18] which suggested that photography might be a feasible and practical alternative when radiography is considered too invasive or logistically impractical.[13,17] Moreover the photographic method is considered to be much easier for the child to cope with when compared with cephalometrics.[8]

Hence the present study was undertaken to assess and correlate the patient soft tissue facial profile with primary molar relationship in 4-5 year age children, using lateral profile photographs.

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Aims & Objectives

AIMS AND OBJECTIVES

- ✓ To assess the prevalence of soft tissue facial profile and molar occlusal type in children of 4-5 yr old age group.
- ✓ To correlate the facial soft tissue measurements with age and gender in the study group.
- ✓ To correlate the molar occlusal type with age and gender in the study group.
- ✓ To correlate the molar relationship with soft tissue profile in 4 – 5 yr old children in Chennai.

Review of Literature

REVIEW OF LITERATURE

STUDIES ON SOFT TISSUE PROFILE ANALYSIS ON ADULTS:

Tanner and Weiner (1949) based on the notion that accurate measurements could be also obtained from standardized photographs examined the reliability of the technique and concluded that although photometry of the trunks and lumba was just as accurate as the direct body measurements, facial measurements were not as reliable. They explained that posing errors were of a greater magnitude than the increments of growth because, in their study, no steps were taken to accurately position the head. They thought that standardized positioning of the face would have significantly improved the reliability of the measurements.[19]

Neger (1959) studied the soft-tissue profile from photographs using six angular relationships between the upper lip, lower lip and chin. This study evaluated the clinical excellent occlusions with acceptable facial forms and other groups of malocclusions. It was found that a proportionate change in improvement of the soft tissue profile does not necessarily accompany extensive dentition changes and therefore, orthodontists can no longer rely entirely on a dento-skeletal analysis for accurate information on the soft-tissue facial profile changes which have occurred during orthodontic treatment. The attention was called to the need for recognizing marked deficiencies in the pogonion area when correcting malocclusion, and the need for evaluating the soft tissue profile as a separate entity, apart from the dentoskeletal analysis were recommended.[20]

Peck and Peck (1970) studied standardized cephalometric and photographic records of Caucasians with pleasing faces. Those authors used the facial angle T-P/N-Pg (102.5º ± 3º) to describe the profile orientation. Both angles compete the information provided by the facial (G-Sn-Pg) and total facial (G-Prn-Pg) convexity angles.[21]

Peck and Peck (1970) used a profilometric analysis based on standardized cephalographs and photographs to assess the soft tissue facial profile. They analysed vertical height by means of angles such as the total vertical (N-T-Pg), the nasal (N-T-Prn), the maxillary (Prn-T-Ls), and the mandibular (Ls-T-Pg) angles. In this investigation the middle and inferior facial thirds were evaluated by the N-T-Sn and Sn-T-Me angles. The inferior third was larger (36º-37º ± 4º) than the middle third (28º-29º± 2.6º).[22]

Gavan et al (1982) pointed to the shortcomings of using photographs as sources of anthropometric data including photographic processing errors (shrinkage), lighting differences and size distortions caused by the enlargement of structures at different distances from the camera. They presented techniques to minimize these problems but their expressed concern was that the data obtained from the two-dimensional photographs were not as accurate as measurements made directly. Although valid, this concern is not applicable if the data collected would be specifically used for two-dimensional applications.[23]

Arnett and Bergman (1993) defined their frontal and lateral analysis from the photographic records of young adult Caucasian taken in natural head position (NHP). Their aim was to quantify average parameters that defined the soft tissue profile. They used, among others, the nasolabial angle and the angle of the contour of the maxillary and mandibular sulcus. They also described the facial profile in class I (165º–175º), class II (< 165º) and class III profiles (>175º) according to the angle of the facial convexity (G-Sn-Pg).[24,25]

Ferrario et al (1993) in their study of photographic evaluation of craniofacial morphometry, evaluated frontal and lateral profile photographs of 108 healthy young adults. This study established the mean values of several soft tissue linear and angular parameters. The comprehensive evaluation of several soft tissue parameters, both linear and angular parameters, established the use of photographic evaluation in treatment planning and diagnosis in orthodontics as well as in orthognathic surgery, plastic surgery and various other fields.[6]

Rivero et al (2003) in their photographic analysis of the facial soft tissue profile on young adults European Caucasion population (212 indiviuals, 50 males, 162 females, 18-20 years of age) concluded that sexual dimorphism exists for several parameters. Also reported that there is wide indiviuals variation in nasolabial and mentolabial angles. The analysis of the soft tissue facial profile from photographic records provides information on the morphology of the profile and its relationship with the underlying dentoskeletal tissues. In this investigation the soft tissue facial profile of a young adult European Caucasian population was studied by means of standardized photographic records taken in the natural head position (NHP). Angular measurements were analysed digitally. Sexual dimorphism was found for several angles: nasofrontal (G-N-Prn: $p<0.001$), vertical nasal (Cm-Sn/N-Prn: $p<0.01$). Wide individuals variations in nasolabial and mentolabial angles were also observed.[7]

Park HS et al (2004) did a study to evaluate the outcomes of aesthetic facial plastic surgery and to develop a photogrammetric profile analysis method, known as “balanced angular profile analysis”. To develop standards and ways to determine the conformation of various soft tissue segments analytically, 19 mean angular values acquired from the photographs of 17 famous female models were standardized to provide reference data, which contain some of the common features and differences between ethnic groups and races.[26]

Milosevic et al (2008) conducted a study to evaluate the variables defining the soft tissue facial profile of a Croatian sample, by means of angular measurements and the gender differences. Standardized photographs on natural head position is taken in 110 dental students between 23 and 28 years with class I occlusion and harmonius soft tissue facial profile. To obtain angular measurements, 12 anatomical landmarks are marked. The results are, distinct gender difference with larger angles in females: nasofrontal, p=0.030, nasolabial, p=0.018, mentolabial, p=0.019, nasal tip angle, p=0.001). The greatest variability found for mentolabial angle. Thus they concluded that these values of class I occlusion subjects can be used as the normal value when evaluating subjects with malocclusion of the same ethnic group.[27]

Husein et al (2010) anthropometric and aesthetic analysis of the Indian American women's face evaluation of facial photographs using Frontal, lateral and basal photographs. There were significant differences between IAW and NAWW in 25 of 30 facial measurements. Six measurements correlated with aesthetic scores: inter-canthial distance, mouth width, nasolabial angle, midface height, ear length and nasal height. Attractive IAW had nine measurements approximating NAWW features, 15 measurements similar to average IAW values and two measurements distinct from both average IAW. The study concluded that facial measurements in IAW are much different from NAWW and these results will assist in preoperative planning. Several features are correlated with attractiveness in IAW: larger and wider-set eyes, a smaller midface, a smaller nose with greater tip rotation, smaller ears and a larger mouth. Attractive IAW display many measurements typical of average IAW and several measurements that reflect average NAWW values.[28]

Munish Reddy et al (2011) conducted a study of photogrammetric analysis of soft tissue profiles of 150 north Indian adults to obtain the average angular photogrammetric measurements of the soft tissue facial profile. The photographic records were taken in natural head position. The facial convexities, maxillary lip contour, nasal tip, nasolabial, nasofacial, nasomental angles showed statistically significant gender differences.[29]

Al-Janabi et al (2013) did a photogrammetric analysis of facial soft tissue profile of Iraqi adults sample with Class I normal occlusion. The purposes of the study were to determine the photogrammetric soft tissue facial profile measurements for Iraqi adults sample with class I normal occlusion using standarized photographic techniques and to verify the existence of possible gender differences. Eighty Iraqi adult subjects (40 males and 40 females) with an age ranged between 18-25 years having class I normal occlusion were chosen for this study. The results indicated that: males had greater facial heights and lengths as well as greater prominences. The mean values of all angular variables were higher in males than females except in the following angular measurements: nasofrontal, mentolabial, angle of the middle facial third, and angle of the head position, with larger male dimensions in all linear measurements of the facial, labial, nasal and chin areas except Canut's nasal prominence in nasal area. The nasofrontal, vertical nasal, nasal dorsum, cervicomental, middle facial third and facial convexity angles showed statistically significant gender differences, in which the male dimensions were larger than females while the nasolabial, the mentolabial, the nasal, the inferior facial third, the head position and total facial convexity angles showed statistically non-significant gender differences.[30]

Ferdousi et al (2013) did angular photogrammetric analysis of the facial profile of the adult Bangladeshi Garo. The aim of the study was to measure some craniofacial angles of the 100 Bangladeshi Garo males and females on standardized facial profile photographs and compare them with each other and with norms of different ethnic group proposed by the other investigators. Statistical analysis showed that the females had significantly higher values than the males in three facial angles ($p< 0.05$): the nasofrontal angle (G-N-Pro, females137.97º± 4.80º; males129.57º±7.96º), the nasomental angle (N-Prn-Pg, females132.79º± 5.10º; males129.75º±7.32º) and the angle of facial convexity (G-Sn-Pg, females169.26º±4.43; males158.65º±12.17º) but no differences between the nasofacial (G-Pg/N-Prn), nasolabial angle (Cm-Sn-Ls). Findings from the present study might help to establish a distinct facial profile trait for the Garo population.[31]

Fernandes et al (2013) conducted a comparative study of the soft tissue of young Japanese-Brazilian, Caucasian and Mongoliod patients concluded that it is necessary to use specific soft tissue standards for this mixed race. The Japanese-Brazilian sample of females showed thinner soft tissue in the nasion region and smaller nose when compared to the Caucasians. The mongoliod sample showed thinner tissues in the supramentonian and pogonion regions. In males, the Japanese-Brazilians had thinner tissues in the nasion region; thicker lower lip and supramentonian region in comparision to the Caucasion sample. For the Mongoliod, soft tissue was thicker in the glabella and ANS-Sn regions.[32]

Bhandari et al (2015) evaluated soft tissue profile through photogrametric analysis in two hundred Himachali ethnic population in 18 to 28 years of age, where the photographs are scaled to life size and landmarks are located to obtain all linear and angular measurements. The results are Himachali males and females show sexual dimorphism ($p<0.05$), with less prominent nose, less protrusive lower lip, and more chin height in males whereas females had more convex profile, less protrusive upper lip and more tipped nose.[33]

STUDIES ON PHOTOMETRIC SOFT TISSUE PROFILE ANALYSIS IN CHILDREN:

Henry W fields et al (1982) reviews the rationale for assessing the facial profile of the patient with a developing dento-facial complex. The purpose of the study was to assess one method of profile analysis utilizing 4 year old children. Sixteen orthodontists and 16 paedodontist were asked to classify the existing skeletal or dental relationship solely from a soft tissue profile tracing or from a lateral facial photograph. The analysis of the data indicated that for this age group neither the orthodontist nor paedodontists could predict accurately the existing skeletal or dental pattern solely from the soft tissue profile tracing or the lateral facial photograph. No significant difference were found between the predictions of the orthodontist and the paedodontist. This investigation notes that even with highly similar dental relationship may occur in preschool children.[34]

Fields et al (1982) reviews the reliability of the soft tissue profile analysis in children. The purpose of their study was to establish the reliability visual assessment of facial profile in children and to determine its effectiveness for children 8 to 12 years old by using orthodontist, pedodontists and dental students as raters. The raters independently classified each child into one of the three skeletal categories: orthognathic, retrognathic and prognathic by evaluating lateral cephalograph tracings and lateral profile photographs. The study concluded that soft tissue outlines from profile radiographs with or without photograph, do not provide enough information to reliably assess the underlying skeletal pattern in children. Also, the assessment was less reliable at 8 years than 12 years of age.[35]

Bishara et al (1985) in a comprehensive study to evaluate the changes in facial dimensions between 4 and 13 years of age, obtained measurements from serial frontal and lateral photographs available on 20 subjects; 10 boys and 10 girls. The following conclusions were made. The total length of the face increased at a rate about two times that of the width of the face. The changes in the dimensions of the eyes were the most stable of all the parameters measured. There was a greater degree of variability in parameters directly affected by variations in facial growth patterns such as chin prominence. The standard deviation was several times greater than the average increment of change. The rates of growth for the vertical length and sagital depth of the nose. The incremental changes in the size of the lips were the most variable, but the total change in the vermillion length was the smallest of all parameters measured.

In the study the reliability of the photographic evaluation was also tested using two investigators on two investigators on two separate occasions. The magnitude of the intra investigator error was 0.5mm or less for 79% of the measurements. Furthermore, 96% of the measurements exhibited less than 1.0mm difference. Only 4% measurements had a difference greater than 1.0mm, the inter examiner error was 0.5mm or less for 73% of the measurements and less than 1.0mm in 98% of the measurements. Only 2% of the measurements showed greater than 1.0mm.[16]

Bearn et al (2002) in a photogrammetric study of the soft tissue profile assessment in unilateral cleft lip and palate, evaluated seven angular measurements on a cleft side and non cleft side profile photograph of 175 children. The study concluded that the soft tissue profile analysis from photographs is reliable and robust under a range of conditions.[36]

Dimmaggio et al (2007) compared the two-dimensional and three dimensional assessment of soft tissue facial profile analyses in 6-year old healthy children. Two-dimensional angular measurements (facial convexity including/excluding the nose; maxillary prominence; nasal prominence; nasolabial; mentolabial; maxilla-labio-mandibular; interlabial) were obtained on the facial profile photographs of 55 boys and 31 girls aged 6; measurements were compared to three dimensional computerized data collected on 27 boys and 28 girls of the same age and ethnic group. Results indicated that on average, in boys, only the angles of facial convexity including the nose, interlabial, nasolabial and maxilla-labio-mandibular showed differences between the means larger than 2º (up to 2.5º). Statistically significant differences ($p<0.05$) were found for the angle of facial convexity including the nose and the maxillary prominence angle. In girls, differences between the two methods larger than 2º were found for the interlabial, maxilla-labio-mandibular (statistically significant) and mentolabial angles (difference up to 7º, corresponding to 4% of the relevant mean). The study concluded that the two dimensional photographic and the three dimensional computerized data, seemed sufficiently interchangeable, at least from a clinical point of view.[37]

Dimagio et al (2007) evaluated soft tissue profile traits in 181, 6 year old children using photogrammetric analysis through left- side profile photographs. Standardized landmarks were digitized on the photographs, and several linear and angular measurements were computed. The children were divided according to dental class and sex and comparison were made by 2-way analyses of variance. The results were that facial convexity (larger in boys than in girls), Sn-N-Sl, and nasolabial and interlabial angles differed significantly between the sexes. Girls had significantly less labial protrusion than boys. Facial height was significantly greater in children with dental class II, without sex differences. All analysed angles were significantly influenced by dental class. Facial convexity was smaller in children with dental class II than in those with dental class III. It was concluded that the significant relationship between dental and cutaneous classes has important implications for orthodontic diagnosis and treatment. Dental class can usefully represent facial esthetics, and orthodontic procedures that modify dental occlusion might cause important repercussions to facial soft tissues.[4]

Dalci.K (2011) conducted a study with 1513, 3-5 year old children from 6 districts of Ankara, inorder to identify the characteristics of soft tissue profiles. They examined the molar relationship and took profile photographs, where four landmarks, soft tissue Glabella (Gl'), Pronasale (Pr), subnasale (Sn), Pogonion (Pog') were marked and Facial Convexity Angle (FCA) and Total Facial Convexity Angle (TFCA) were measured. The mean values for the Total Facial Convexity Angle was (145.9°± 4.2) and Facial Convexity Angle was (165.3°±4.5), which significantly influenced the primary second molar terminal plane relationship. Thus they concluded that relationship between primary occlusion and degree of convexity of soft tissue profile was found to be great importance in the early diagnosis of dentoskeletal discrepancies.[8]

Bazemi et al (2013) in a cross sectional study in children of West Bengal, evaluated selected linear measurements of facial soft tissue profile assessment on 250 children of 6 to 14 years of age. Results indicated that, in 6-8 years age group, male's average inter-endocanthion distance was significantly higher than that of females ($p<0.005$), whereas in 12-14 years of age group, the same parameter for females was significantly higher than that of males ($p<0.001$). In 9-11 years age group, the average distance of exocanthion to exocanthion was higher for males compared to females, but the difference was not significant at 5% level ($p>0.05$), though for 87% of cases, it was significant ($p=0.13$). Total facial height for male subject was significantly high compared to that of females ($p<0.001$) in 12-14 years of age group.[38]

Materials & Methods

MATERIALS & METHODS

Six hundred school going children aged 4-5 years of both sexes were screened, from which four hundred and seventy four children who satisfied the inclusion criteria were selected, based on their willingness to participate with an informed written consent signed by their parent / guardian. The study was preferred to assess and correlate the primary molar occlusal type and soft tissue facial profile using lateral profile photographs and casts.

Armamentarium

- Mouth mirror
- Explorer
- Disposable dual impression trays
- Putty impression material
- Dental stone
- Dental plaster
- Digital camera
- Mirror
- Acrobat photoshop software
- SPSS software (version 17.0 for Windows)

Criteria for inclusion

- Children with overall good general / oral health (with no systemic illness or oral disorders)

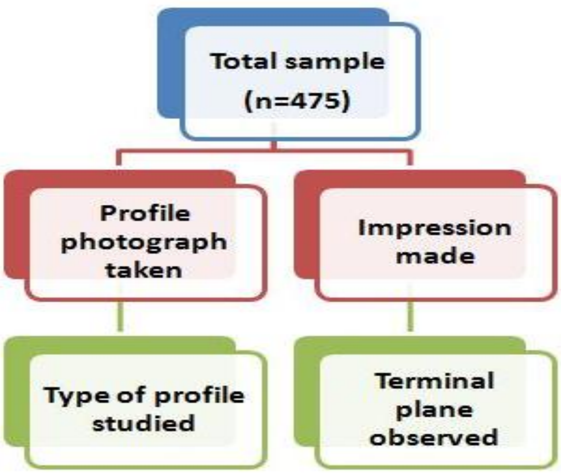
- Children with complete set of primary dentition of 4 to 5 years of age.
- Children with minimal or no caries without loss of tooth structure.
- Children with co-operative ability.

Criteria for exclusion

- Children whose parents are not willing to participate in the study.
- Children with any missing primary teeth.
- Children with incipient malocclusion and oral habits.
- Children with congenital abnormalities and debilitating diseases.

Clinical and sampling procedure:

Six hundred children were examined out of which, four seventy four school going children of both sexes aged 4-5 years were selected from four schools for the present study after satisfying the inclusion criteria. The parents were explained about the study and an informed written consent was obtained.



The methodology followed in the present study was in accordance to Gomes et al.[39]

Photographic procedure:

Standardized right profile photographs were taken in the Natural head position (NHP), with maximum inter cuspation and lips at rest. Glasses were removed and hair piled high on the head to ensure that patients' forehead, neck and ears were clearly visible. To obtain an NHP, a 75*30 cm mirror was placed opposite to the child at 120cm distance. A vertical scale was adapted in a plumb line, which indicated the true vertical. The scale was positioned in the mid sagittal plane to allow later measurements at life size (1:1). Children were asked to keep feet slightly apart and arms relaxed and to stand a step behind the line drawn 120cm from the mirror.

To achieve the "orthoposition", patients were instructed to tilt their head up and down with decreasing amplitude until they felt relaxed. They were asked to take a step forward and keep looking straight ahead into the reflection of their eyes in the mirror. The same digital camera, mounted with the same lens and flash was used for all photographic records. The camera was secured on a tripod for stabilization and adjustments according to the child's height. The 100mm macro lens was chosen to avoid facial deformations and maintain natural proportions. The camera was used in its manual position to achieve maximum image quality given in the local light condition.

Lateral images were accepted satisfactory if they completed with the following photographic criteria. All defined landmarks are visible. The sagittal view includes the area anterior to the ear and extends vertically from the soft tissue chin to the glabella and tragion. The opposite pupil, eyebrows and eyelashes are not visible. One philtral column is visible, the lips are lightly touching. There are no cast shadows and all facial features are visible.

Images are transferred to a computer using Photoshop 7.0 (Acrobat Systems Inc, Minnesota, United states). The soft tissue landmarks are marked and ten facial profile angular measurements are made. Soft tissue facial profile was classified by Arnett and Bergman et al, into Class I / Straight (165º-175º), Class II / Convex (<165º), Class III / Concave (>175º), according to the angle of the facial convexity(G-Sn-Pg).[24,25]

Soft tissue analysis relies on angular, linear or planar measurements or combination of the three.[16] Angular photometric analyses require no reference planes and angular measurements are not affected by photographic enlargement.[26]

Impression procedure:

Children were asked to sit and the dual impression tray and putty impression material were used to take impression. Dental cast and base were made in all impressions. Terminal plane relationship were studied and recorded from the cast. The terminal plane was classified by Baume in 1950 into three types, viz. *Flush terminal plane:* When the distal surfaces of the upper and lower second primary molars were in the same vertical plane in centric occlusion; *Distal step:* When the distal surface of the lower second primary molar is more distal to that of the upper in centric occlusion; and *Mesial step:* When the distal surface of the lower second primary molar is more mesial to that of the upper in centric occlusion.[40] This terminal plane relationship is used to forecast the future interocclusal relation of the erupting first permanent molars. While functionally insignificant at this time, this relationship can greatly influence the position of the first permanent molars later, as the eruption path of the first permanent molars is guided by the distal surface of the distal root and tooth crown of the second primary molar.[41]

The soft tissue profile measurements were correlated with molar occlusal type, age and gender.

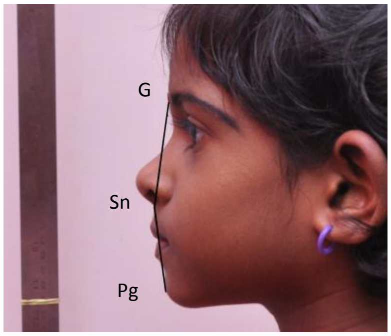
Figures

FIGURE 1: SCREENING PROCEDURE

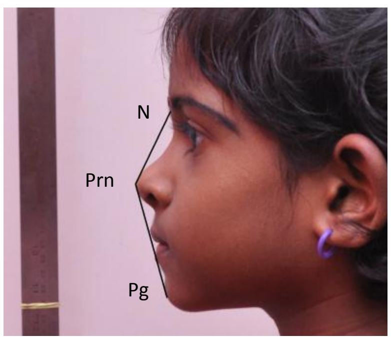
FIGURE 2: IMPRESSION PROCEDURE

FIGURE 3: PHOTOGRAPHIC PROCEDURE

FIGURE 4: SOFT TISSUE FACIAL PROFILE ANGLES:



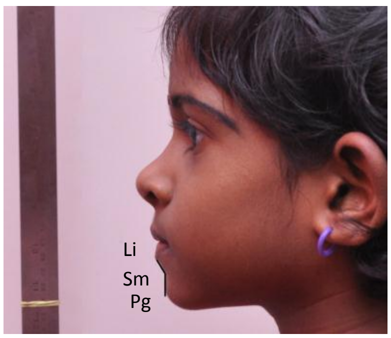
Facial convexity angle
(G-Sn-Pg)



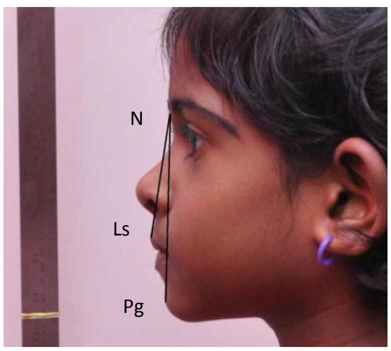
Total facial convexity angle
(N-Prn-Pg)

Nasofrontal angle (G-N-Nd)

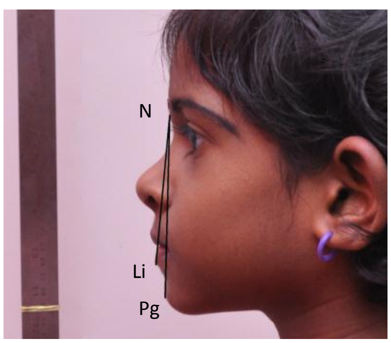
Nasolabial angle (Cm-Sn-Ls)



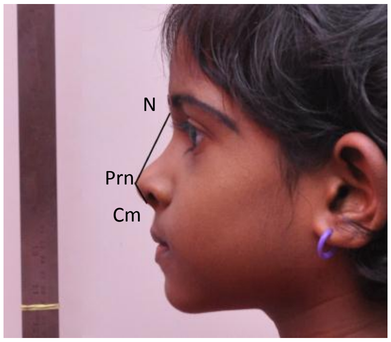
Mentolabial sulcus
(Li-Sm-Pg)



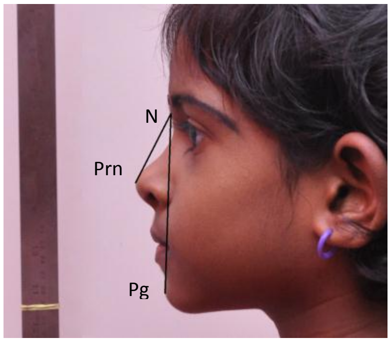
Projection of upper lip to
chin (N-Pg/N-Ls)



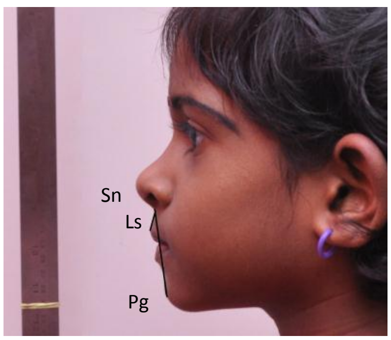
Projection of lower lip to
chin(N-Pg/N-Li)



Nasal tip angle (N-Prn-Cm)



Nasomental angle
(N-Prn/N-Pg)



Upper lip angle
(Sn-Ls/Sn-Pg)

FIGURE 5: PRIMARY MOLAR OCCLUSAL TYPE

Flush terminal plane

Mesial Step Terminal Plane

Distal Step Terminal Plane

Results

RESULTS

Graph 1 shows, distribution of the study population. Among 474 children, 220 (46.41%) were boys and 254 (53.58%) were girls, 232 (48.94%) were 4 years old and 242 (51.05%) were 5 year old. No gender and age difference seen among the study sample. ($p>0.005$)

Table 1 shows, the prevalence of primary second molar occlusal type and soft tissue profile of the children. 221 (46.60%) had flush terminal plane, 159 (33.5%) had distal step and 94 (19.8%) had mesial step. ($p=0.000$)***

257 (54.2%) had straight profile, followed by 200 (42.2%) had convex profile and 17 (3.60%) had concave profile being the least prevalent. ($p=0.000$)***

Table 2 shows, the prevalence of second primary molar occlusal type between boys and girls. Among 220 boys, 96 (43.6%) boys had flush terminal plane, 85 (38.6%) boys had distal step and 39 (17.7%) boys had mesial step. Among 254 girls, 125 (49.2%) girls had flush terminal plane, followed by 74 (29.1%) children had distal step and 55 (21.7%) children had mesial step. No significant difference in the primary second molar occlusal type between boys and girls. ($p=0.087$)

Table 3 shows, the prevalence of soft tissue profile between boys and girls. Among 220 boys, 106 (48.2%) boys had convex profile, 101 (45.9%) boys had straight profile and 13 (5.9%) boys had concave profile. Among 254 girls, 156 (61.40%) girls had straight profile, followed by 94 (37%) girls had convex profile and 4 (1.6%) girls had concave profile. There is significant difference in the soft tissue facial profile between boys and girls. (p=0.001)***

Table 4 shows, the prevalence of primary second molar occlusal type in 4 and 5 year age group. Among 232, 4-year old children, 114 (49.1%) children had flush terminal plane, 79 (34.1%) children had distal step and 39 (16.8%) children had mesial step. Among 242, 5-year old children, 107 (44.2%) children had flush terminal plane, 80 (33.1%) children had distal step and 55 (22.7%) children had mesial step. There is no significant difference in the primary second molar occlusal type between 4 year and 5 year old children. (p=0.254)***

Table 5 shows, the prevalence of soft tissue facial profile in 4 and 5 year old children. Among 232, 4-year old children, 121 (52.2%) children had straight profile, 100 (43.1%) children had convex profile and 11 (4.7%) children had concave profile. Among 242, 5-year old children, 136 (56.2%) children had straight profile, 100 (41.3%) children had convex profile and 6 (2.5%) children had concave profile. There is no significant difference in the soft tissue facial profile between 4 year and 5 year old children. (p=0.344)

Table 6 shows, the mean value with standard deviation of study variables. The mean with standard deviation of Facial convexity angle is 165.85º ± 5.04575º with the range from 165.39º to 166.30º, Total facial convexity angle is 138.50º ± .4.37330º with the range from 138.10º to 138.89, Nasofrontal angle is135.08º ± 1.4732º with the range from 138.13º to 140.43º, Nasolabial angle is 105.97º ± 11.4145º with the range from 103.58º to 105.81º, Mentolabial angle is 136.61º ± 12.3683º with the range from 134.99º to 139.43º, Projection of upper lip to chin is 10.4241º ± 2.09488º with the range from 10.23º to 10.61º, Projection of lower lip to chin is 6.2326º ± 3.91012º with the range from 5.87º to 6.58º, Nasal tip angle is 60.3397º ± 8.47535º with the range from 59.57º to 61.10º, Nasomental angle is 25.0316º ± 3.53135º with the range from 24.71º to 25.35º, Upper lip angle is 26.6519º ± 8.37387º with the range from 25.89º to 27.40º.

Table 7 shows, the mean value of study variables between 4 and 5 years of age. The mean value of Facial convexity angle in 4 year old is 166.02º ± 5.365º and 5 year old is 166.02º ± 4.717º, Total facial convexity angle in 4 year old is 139.02º ± 4.248º and 5 year old is 138.02º ± 4.384º, Nasofrontal angle in 4 year old is 135.89º ± 1.421º and 5 year old is 135.7º ±1.047º, Nasolabial angle in 4 year old is 104.43º ± 11.09º and 5 year old is 104.795º ± 11.4º, Mentolabial angle in 4 year old is 137.58º ± 12.23º and 5 year old is 136.69º ±11.89º, Projection of upper lip to chin in 4 year old is 10.280º ± 2.047º and 5 year old is 10.562º ± 2.134º, Projection of lower lip to chin in 4 year old is 5.875º ± 1.73º and 5 year old is 6.576º ± 5.19º, Nasal tip angle in 4 year old is 57.948º ± 8.329º and 5 year old is 62.632º ± 7.981º, Nasomental angle in 4 year old is 24.754º ± 3.54º and 5 year old is 25.297 ± 3.509, Upper lip angle in 4 year old is 26.301º ± 8.064º and 5 year old is 26.987º ± 8.663º. There is significant difference in Total facial convexity angle, Nasal tip angle between 4 – 5 years of age. All other parameters are non-significant. ($p>0.005$).

Table 8 shows, the mean with standard deviation of study variables between boys and girls. The mean value of Facial convexity angle in boys is 165.69º ± 4.86º and in girls is 165.99º ± 5.204º, Total facial convexity angle is in boys is 138.49º ± 4.51º and in girls is 138.50º ± 4.26º, Nasofrontal angle is in boys is 135.89º ± 1.421º and in girls is 135.7º ± 1.54º, Nasolabial angle is in boys is 104.43º ± 11.09º and in girls is 105.795º ± 11.4º, Mentolabial angle is in boys is 136.58º ± 12.23º and in girls is 136.69º ±11.89º, Projection of upper lip to chin is in boys is 10.44º ± 2.0º and in girls is 10.40º ± 2.17º, Projection of lower lip to chin is in boys is 6.17º ± 2.01º and in girls is 6.28º ± 5.0º, Nasal tip angle is in boys is 60.40º ± 8.61º and in girls is 60.28º ± 8.36º, Nasomental angle is in boys is 24.99º ± 3.59º and in girls is 25.06º ± 3.47º, Upper lip angle is in boys is 26.46º ± 8.46º and in girls is 26.81º ± 8.30º. Significant difference was seen with Nasolabial angle between boys and girls. ($p = 0.000)^{***}$ All other parmeters were non-significant. ($p>0.005$)

Table 9 shows, the mean Facial convexity angle for children with distal step and concave profile (175º ± 5.02º) and with distal step and convex profile (160.57º ± 5.04º) and with distal step and straight profile (164.4º ± 5.11º).

The mean Facial convexity angle for children with mesial step and concave profile (176.1º ± 5.11º) and with mesial step and convex profile (165º ± 4.57º) and with mesial step and straight profile (169.7º ± 5.02º).

The mean Facial convexity angle for children with flush terminal plane and concave profile (175.8º ± 4.62º) and with flush terminal plane and convex profile (164º ± 4.65º) and with flush terminal plane and straight profile (168.2º ± 5.01º).

The overall mean of Facial convexity angle for children with distal step (166.65º ± 5.05º) and with mesial step (170.26º ± 5.01º), and with flush terminal plane (169.36º ± 4.6º). The overall mean of facial convexity angle of the children with concave profile (175.6º ± 5.06º), and with convex profile (163.19º ±4.45º), and with straight profile (167.46º ± 5.03º).

Significant correlation was seen between the Facial convexity angle with molar occlusal type and with soft tissue profile. ($p<0.005$)***

The mean Total facial convexity angle for children with distal step and concave profile (145º ± 4.47º) and with distal step and convex profile (135.38º ± 4.37º) and with distal step and straight profile (138º ± 4.38º).

The mean Total facial convexity angle for children with mesial step and concave profile (144.5º ± 4.41º) and with mesial step and convex profile (136.5º ± 4.7º) and with mesial step and straight profile (140.86º ± 4.37º).

The mean Total facial convexity angle for children with flush terminal plane and concave profile (146º ± 4.21º) and with flush terminal plane and convex profile (137.8º ± 4.3º) and with flush terminal plane and straight profile (139.65º ± 4.35º).

The overall mean of Total facial convexity angle for children with distal step (139.62º ± 4.3º) and with mesial step (140.62º ± 4.4º), and with flush terminal plane(141.15º ± 4.3º) and the overall mean of Total facial convexity angle of the children with concave profile (145.3º ± 4.4º), and with convex profile (136.56º ± 4.2º), and with straight profile (139.5º ± 4.3º).

Significant correlation was seen between the study variable with molar occlusal type and soft tissue profile with Total facial convexity angle. ($p<0.005$)***

The mean Nasofrontal angle for children with distal step and concave profile (139º ± 1.78º) and with distal step and convex profile (135.09º ± 1.46º) and with distal step and straight profile (135.2º ± 1.49º).

The mean Nasofrontal angle for children with mesial step and concave profile (137.8º ± 1.47º) and with mesial step and convex profile (137.5º ± 1.21º) and with mesial step and straight profile (135.08º ± 1.44º).

The mean Nasofrontal angle for children with flush terminal plane and concave profile (135.8º ± 1.55º) and with flush terminal plane and convex profile (134.91º ± 1.53º) and with flush terminal plane and straight profile (135.88º ± 1.47º).

The overall mean of Nasofrontal angle for children with distal step (136.43º ± 1.47º) and with mesial step (136.63º ± 1.3º), and with flush terminal plane (135.53º ± 1.5º). The overall mean of Nasofrontal angle of the children with concave profile (137.53º ± 1.5º), and with convex profile (135.66º ± 1.45º), and with straight profile (135.38º ± 1.46º).

No significant correlation was seen between the study variable with molar occlusal type and soft tissue profile with Nasofrontal angle. ($p>0.005$)

The mean Nasolabial angle for children with distal step and concave profile (110º ± 10.44º) and with distal step and convex profile (106.96º ±11.4º) and with distal step and straight profile (106.61º ± 11.3º).

The mean Nasolabial angle for children with mesial step and concave profile (101.1º ± 11.5º) and with mesial step and convex profile (106º ±10.85º) and with mesial step and straight profile (106.98º ± 11.4º).

The mean Nasolabial angle for children with flush terminal plane and concave profile (102º ± 11.65º) and with flush terminal plane and convex profile (107.2º ± 11.5º) and with flush terminal plane and straight profile (106.97º ± 11.4º).

The overall mean of Nasolabial angle for children with distal step (107.85º ± 11.5º) and with mesial step (104.69º ± 11.4º), and with flush terminal plane (105.39º ± 11.5º). The overall mean of Nasolabial angle of the children with concave profile (104.36º ± 11.2º), and with convex profile (106.72º ± 11.4º), and with straight profile (106.85º ± 11.33º).

No significant correlation was seen between the Nasolabial angle with molar occlusal type and soft tissue profile. ($p>0.005$)

The mean Mentolabial angle for children with distal step and concave profile (130º ± 11.53º) and with distal step and convex profile (136.6º ± 12.38º) and with distal step and straight profile (137.25º ± 12.48º).

The mean Mentolabial angle for children with mesial step and concave profile (135.8º ± 12.4º) and with mesial step and convex profile (140.5º ±12.95º) and with mesial step and straight profile (136.6º ± 12.34º).

The mean Mentolabial angle for children with flush terminal plane and concave profile (130.4º ± 11.99º) and with flush terminal plane and convex profile (139.53º ± 12.3º) and with flush terminal plane and straight profile (136.62º ± 12.37º).

The overall mean of Mentolabial angle for children with distal step (134.61º ± 12.04º) and with mesial step (137.46º ± 12.24º), and with flush terminal plane (135.5º ± 12.24º). The overall mean of Mentolabial angle of the children with concave profile (132.06º ± 11.52º), and with convex profile (138.71º ± 12.2º), and with straight profile (136.82º ±12.4º).

No significant correlation was seen between the Mentolabial angle with molar occlusal type and soft tissue profile. ($p>0.005$)

The mean Projection of Upper lip to Chin for children with distal step and concave profile (16º ± 2.16º) and with distal step and convex profile (7.14º ± 2.09º) and with distal step and straight profile (10.4º ± 2.13º).

The mean Projection of Upper lip to Chin for children with mesial step and concave profile (7.9º ± 2.1º) and with mesial step and convex profile (12º ± 2.24º) and with mesial step and straight profile (9.52º ± 2.1º).

The mean Projection of Upper lip to Chin with flush terminal plane and concave profile (8.4º ± 1.98º) and with flush terminal plane and convex profile (11.07º ± 2.08º) and with flush terminal plane and straight profile (9.76º ± 2.08º).

The overall mean of Projection of Upper lip to Chin for children with distal step (11.18º ± 2.12º) and with mesial step (9.8º ± 2.12º), and with flush terminal plane (9.74º ± 2.08º). The overall mean of Projection of Upper lip to Chin of the children with concave profile (10.76º ± 2.2º), and with convex profile (10.07º ± 2.1º), and with straight profile (9.89º ± 2.1º).

Significant correlation was seen between the Projection of Upper lip to Chin with soft tissue profile. ($p<0.005$)*** No significant correlation with molar occlusal type.

The mean Projection of Lower lip to Chin for children with distal step and concave profile (4º ± 2.18º) and with distal step and convex profile (7º ± 3.9º) and with distal step and straight profile (6º ± 1.95º).

The mean Projection of Lower lip to Chin for children with mesial step and concave profile (4.3º ± 4.12º) and with mesial step and convex profile (8º ± 2.29º) and with mesial step and straight profile (5.74º ± 3.92º).

The mean Projection of Lower lip to Chin for children with flush terminal plane and concave profile (4.8º ± 2.06º) and with flush terminal plane and convex profile (7.62º ± 3.95º) and with flush terminal plane and straight profile (5.3º ± 3.92º).

The overall mean of Projection of Lower lip to Chin for children with distal step (5.6º ± 2.4º) and with mesial step (6.01º ± 3.9º), and with flush terminal plane (5.9º ± 3.9º). The overall mean of Projection of Lower lip to Chin of the children with concave profile (4.36º ± 2.04º), and with convex profile (7.54º ± 3.8º), and with straight profile (5.68º ± 3.9º).

Significant correlation was seen between the Projection of Lower lip to Chin with soft tissue profile. ($p<0.005$)*** No significant correlation with molar occlusal type.

The mean Nasal tip angle for children with distal step and concave profile (58º ± 9.59º) and with distal step and convex profile (61.66º ± 8.48º) and with distal step and straight profile (59.6º ± 8.23º).

The mean Nasal tip angle for children with mesial step and concave profile (57.4º ± 8.61º) and with mesial step and convex profile (63º ± 5.51º) and with mesial step and straight profile (60.19º ± 8.42º).

The mean Nasal tip angle for children with flush terminal plane and concave profile (61º ± 8.21º) and with flush terminal plane and convex profile (58.83º ± 8.34º) and with flush terminal plane and straight profile (58.5º ± 8.46º).

The overall mean of Nasal tip angle for children with distal step (59.7º ± 8.2º) and with mesial step (60.19º ± 8.4º), and with flush terminal plane (59.44º ± 8.4º). The overall mean of Nasal tip angle of the children with concave profile (58.8º ± 8.6º), and with convex profile (61.16º ± 8.3º), and with straight profile (59.43º ± 8.4º).

No significant correlation was seen between the Nasal tip angle with molar occlusal type and with soft tissue profile. ($p>0.005$)

The mean Nasomental angle for children with distal step and concave profile (20.5º ± 3.3º) and with distal step and convex profile (27.21º ± 3.53º) and with distal step and straight profile (25.2º ± 3.46º).

The mean Nasomental angle for children with mesial step and concave profile (21.1º ± 3.43º) and with mesial step and convex profile (27.5º ± 3.32º) and with mesial step and straight profile (23.73º ± 3.34º).

The mean Nasomental angle for children with flush terminal plane and concave profile (20.6º ± 3.08º) and with flush terminal plane and convex profile (25.62º ± 3.39º) and with flush terminal plane and straight profile (23.1º ± 3.53º).

The overall mean of Nasomental angle for children with distal step (24.3º ± 3.4º) and with mesial step (24.11º ± 3.34º), and with flush terminal plane (23.1º ± 3.3º). The overall mean of Nasomental angle of the children with concave profile (20.73º ± 3.4º), and with convex profile (26.77º ± 3.5º), and with straight profile (24.01º ± 3.34º).

No significant correlation was seen between the study varialble with molar occlusal type and soft tissue profile ($p>0.005$).

The mean Upper lip angle for children with distal step and concave profile (18º ± 8.09º) and with distal step and convex profile (28.48º ± 8.38º) and with distal step and straight profile (25.6º ± 8.46º).

The mean Upper lip angle for children with mesial step and concave profile (25.1º ± 8.43º) and with mesial step and convex profile (29.5º ± 8.73º) and with mesial step and straight profile (25.68º ± 8.4º).

The mean Upper lip angle for children with flush terminal plane and concave profile (26.2º ± 8.05º) and with flush terminal plane and convex profile (27.7º ± 8.44º) and with flush terminal plane and straight profile (24.35º ± 8.39º).

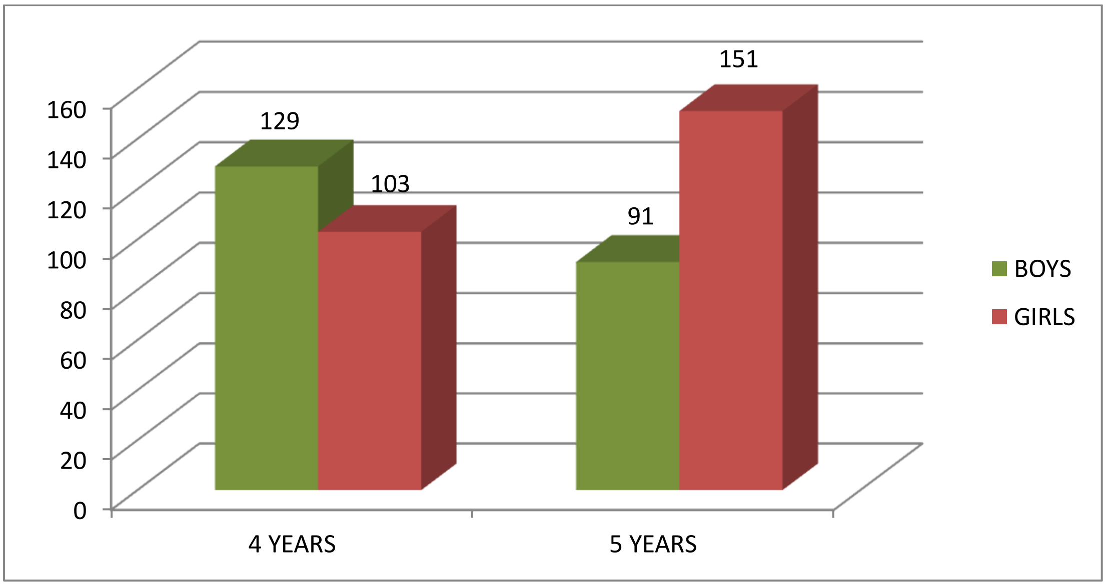
The overall mean of Upper lip angle for children with distal step (24.02º ± 8.3º) and with mesial step (26.76º ± 8.4º), and with flush terminal plane (26.06º ± 8.2º). The overall mean of Upper lip angle of the children with concave profile (23.1º ± 8.1º), and with convex profile (28.56º ± 8.4º), and with straight profile (25.21º ± 8.3º).

No significant correlation was seen between the Upper lip angle with molar occlusal type and with soft tissue profile. ($p>0.005$)

Tables and Graphs

The present study was conducted to correlate the molar relationship with soft tissue profile parameters in 4 years and 5 years old children, satisfying the inclusion and exclusion criteria in Chennai by using standardized photographic technique and casts made. The study also tested the correlations of the outcome variables with the independent variable. The sample size consisted of 254 females and 220 males. The mean age of the sample collected was 4.5years.

GRAPH 1: AGE AND GENDER DISTRIBUTION



No significant difference between 4 and 5 year age group. ($p>0.005$)

No significant difference between boys and girls ($p>0.005$)

TABLE: 1 PREVALENCE OF MOLAR OCCLUSAL TYPE AND SOFT TISSUE PROFILE

			Molar			Total
			Flush	Mesial	Distal	
PROFILE	Straight	Count	160	82	15	257
		% within PROFILE	62.30%	31.90%	5.80%	100.00%
		% within molar	72.40%	87.20%	9.40%	54.20%
	Convex	Count	56	2	142	200
		% within PROFILE	28.00%	1.00%	71.00%	100.00%
		% within molar	25.30%	2.10%	89.30%	42.20%
	Concave	Count	5	10	2	17
		% within PROFILE	29.40%	58.80%	11.80%	100.00%
		% within molar	2.30%	10.60%	1.30%	3.60%
Total		Count	221	94	159	474
		% within PROFILE	46.60%	19.80%	33.50%	100.00%
		% within molar	100.00%	100.00%	100.00%	100.00%

Flush terminal plane is the most prevelant primary second molar occlusal type. Straight profile is the most prevalent soft tissue facial profile
(p= 0.000 *** - significant)

GRAPH 2: PREVALENCE OF MOLAR OCCLUSAL TYPE AND SOFT TISSUE PROFILE

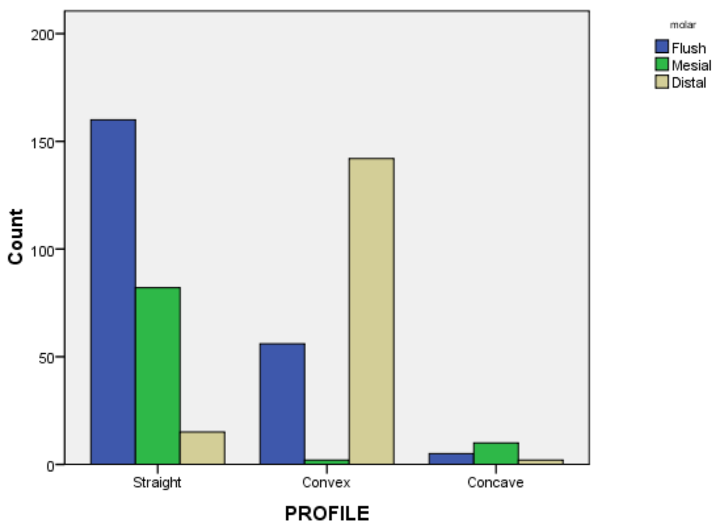


TABLE 2: PREVALENCE OF MOLAR OCCLUSAL TYPE – GENDER WISE

			Molar			Total
			Flush	Mesial	Distal	
SEX	Boys	Count	96	39	85	220
		% within SEX	43.60%	17.70%	38.60%	100.00%
	Girls	Count	125	55	74	254
		% within SEX	49.20%	21.70%	29.10%	100.00%
		Count	221	94	159	474
		% within SEX	46.60%	19.80%	33.50%	100.00%

No significant difference in primary second molar occlusal type between boys and girls.

(p value = 0.087, NS)

GRAPH 3 : PREVALENCE OF MOLAR OCCLUSAL TYPE – GENDER WISE

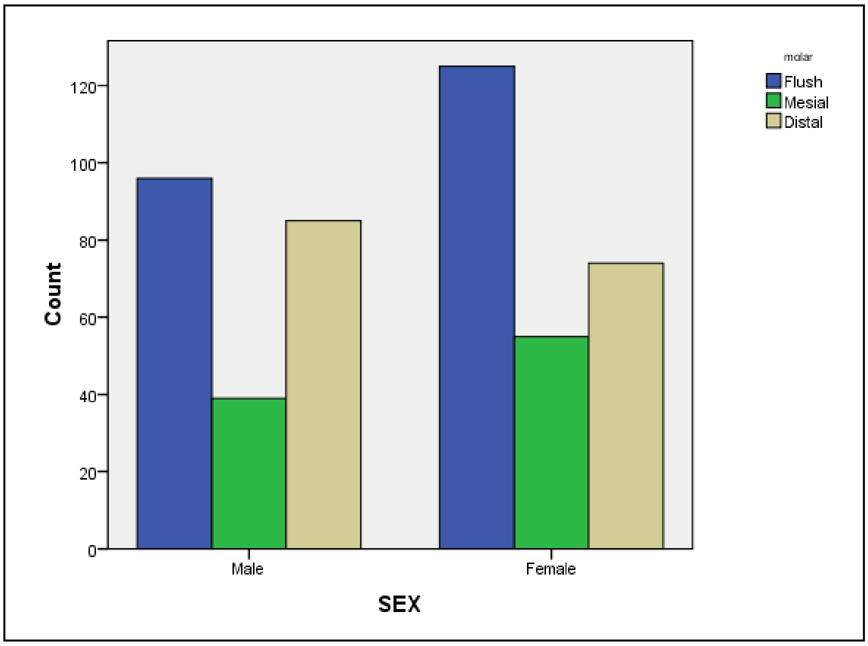


TABLE 3: PREVALENCE OF SOFT TISSUE FACIAL PROFILE – GENDER WISE

			PROFILE			Total
			Straight	Convex	Concave	
SEX	Boys	Count	101	106	13	220
		% within SEX	45.90%	48.20%	5.90%	100.00%
	Girls	Count	156	94	4	254
		% within SEX	61.40%	37.00%	1.60%	100.00%
Total		Count	257	200	17	474
		% within SEX	54.20%	42.20%	3.60%	100.00%

Convex profile is more prevalent in boys, straight profile is more prevalent in girls.

(p value = 0.001^{***} significant)

GRAPH 4: PREVALENCE OF SOFT TISSUE FACIAL PROFILE – GENDER WISE

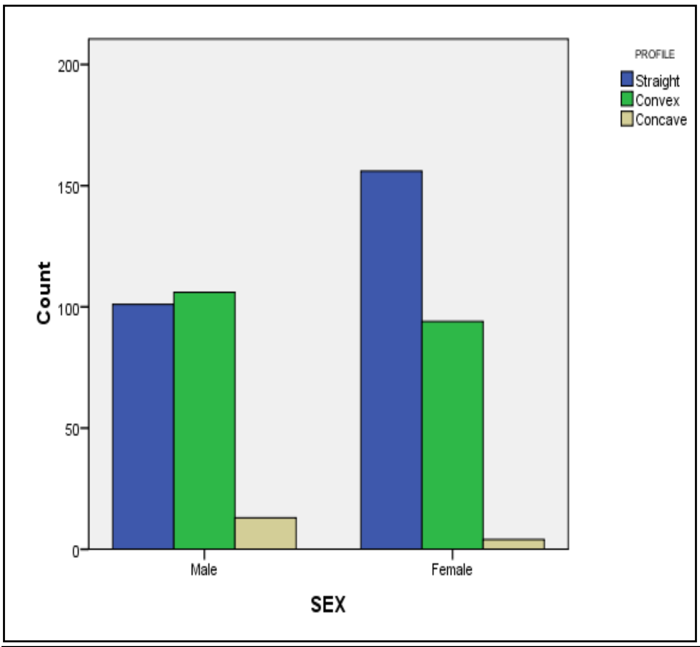


TABLE 4: PREVALENCE OF MOLAR OCCLUSAL TYPE – AGE WISE

			Molar			Total
			Flush	Mesial	Distal	
AGE	4 years old	Count	114	39	79	232
		% within AGE	49.10%	16.80%	34.10%	100.00%
	5 years old	Count	107	55	80	242
		% within AGE	44.20%	22.70%	33.10%	100.00%
Total		Count	221	94	159	474
		% within AGE	46.60%	19.80%	33.50%	100.00%

No significant difference in primary second molar occlusal type between 4 and 5 year age group.

(p value = 0.254 non-significant)

GRAPH 5: PREVALENCE OF MOLAR OCCLUSAL TYPE – AGE WISE

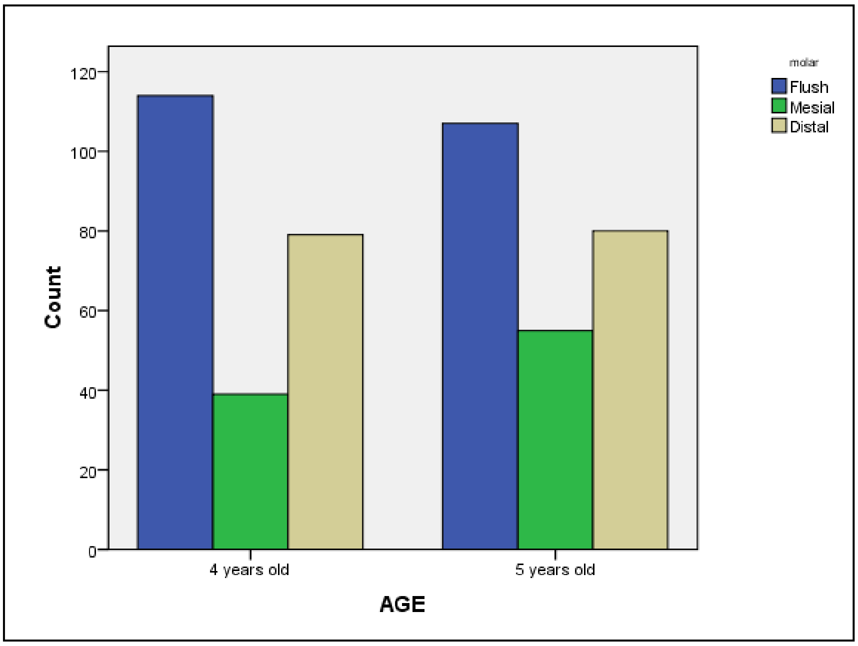


TABLE 5: PREVALENCE OF SOFT TISSUE FACIAL PROFILE – AGE WISE

			PROFILE			
			Straight	Convex	Concave	Total
AGE	4 years old	Count	121	100	11	232
		% within AGE	52.20%	43.10%	4.70%	100.00%
	5 years old	Count	136	100	6	242
		% within AGE	56.20%	41.30%	2.50%	100.00%
Total		Count	257	200	17	474
		% within AGE	54.20%	42.20%	3.60%	100.00%

No significant difference in soft tissue facial profile between 4 and 5 year age group.
(p value = 0.344 non-significant)

GRAPH 6: PREVALENCE OF SOFT TISSUE FACIAL PROFILE – AGE WISE

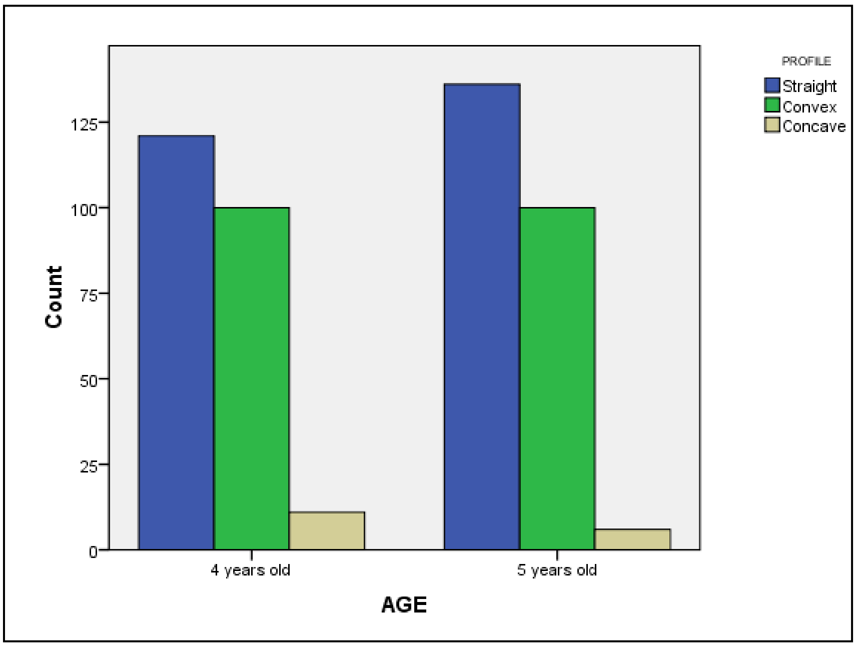


TABLE 6 : MEAN VALUE OF STUDY VARIABLES

SOFT TISSUE VARIABLES	MEAN WITH STANDARD DEVIATION	MINIMUM RANGE – MAXIMUM RANGE
Facial convexity angle (GSnPg)	165.85 ± 5.04575	165.39 -166.30
Total facial convexity angle (NPrnPg)	138.50 ± 4.37330	138.10-138.89
Nasofrontal angle (GNNd)	135.08 ± 1.4732	138.13-140.43
Nasolabial angle (CmSnLs)	105.97 ± 11.4145	103.58-105.81
Mentolabial angle (LiSmPg)	136.61± 12.3683	134.99-139.43
Projection of upper lip to chin (NPg/ NLs)	10.4241± 2.09488	10.23-10.61
Projection of lower lip to chin (NPg/ NLi)	6.2326 ±3.91012	5.87-6.58
Nasal tip angle (NPrnCm)	60.3397±8.47535	59.57-61.10
Nasomental angle (NPrn/NPg)	25.0316±3.53135	24.71-25.35
Upper lip angle (SnLs/SnPg)	26.6519±8.37387	25.89-27.40

TABLE 7: MEAN VALUE OF STUDY VARIABLE – AGE WISE

	AGE	Mean + standard deviation	p- value (student's t-test)
Facial convexity angle (GSnPg)	4 years	166.02 ± 5.365	NS
	5 years	166.02 ± 4.717	
Total facial convexity angle (NPrnPg)	4 years	139.02±4.248	S
	5 years	138.02±4.384	
Nasofrontal angle (GNNd)	4 years	135.89±1.421	NS
	5 years	135.7±1.047	
Nasolabial angle (CmSnLs)	4 years	104.43±11.09	NS
	5 years	104.795±11.4	
Mentolabial angle (LiSmPg)	4 years	137.58±12.23	NS
	5 years	136.69±11.89	
Projection of upper lip chin (NPg/ NLs)	4 years	10.280±2.047	NS
	5 years	10.562±2.134	
Projection of lower lip to chin (NPg/ NLi)	4 years	5.875± 1.73	NS
	5 years	6.576 ± 5.19	
Nasal tip angle (NPrnCm)	4 years	57.948 ± 8.329	S
	5 years	62.632 ± 7.981	
Nasomental angle (NPrn/NPg)	4 years	24.754 ± 3.54	NS
	5 years	25.297 ± 3.509	
Upper lip angle (SnLs/SnPg)	4 years	26.301 ± 8.064	NS
	5 years	26.987 ± 8.663	

Significant difference in Total facial convexity angle ($p<0.005$) *** and Nasal tip angle ($p<0.005$)*** between 4 and 5 years. All other parameters non-significant ($p > 0.005$)

TABLE 8 : MEAN VALUE OF STUDY VARIABLE – GENDER WISE

	AGE	Mean + standard deviation	p- value
Facial convexity angle (GSnPg)	Boys	165.69 ± 4.86	NS
	Girls	165.99 ± 5.204	
Total facial convexity angle (NPrnPg)	Boys	138.49±4.51	NS
	Girls	138.50±4.26	
Nasofrontal angle (GNNd)	Boys	135.89±1.421	NS
	Girls	135.7±1.54	
Nasolabial angle (CmSnLs)	Boys	104.43±11.09	S
	Girls	105.795±11.4	
Mentolabial angle (LiSmPg)	Boys	136.58±12.23	NS
	Girls	136.69±11.89	
Projection of upper lip to chin (NPg/ NLs)	Boys	10.44±2.0	NS
	Girls	10.40±2.17	
Projection of lower lip to chin (NPg/ NLi)	Boys	6.17± 2.01	NS
	Girls	6.28± 5.0	
Nasal tip angle (NPrnCm)	Boys	60.40 ± 8.61	NS
	Girls	60.28 ± 8.36	
Nasomental angle (NPrn/NPg)	Boys	24.99 ± 3.59	NS
	Girls	25.06± 3.47	
Upper lip angle (SnLs/SnPg)	Boys	26.46 ± 8.46	NS
	Girls	26.81 ± 8.30	

Significant difference in Nasolabial angle ($p<0.005$) *** between boys and girls.

All other parameters non-significant ($p > 0.005$)

TABLE 9: CORRELATION OF STUDY VARIABLES WITH MOLAR OCCLUSAL TYPE AND SOFT TISSUE PROFILE

Variables		Distal step	Mesial step	Flush	Mean	p - value	
						Molar	Soft tissue
Facial convexity angle (GSnPg)	concave	175±5.02	176.1±5.11	175.8±4.62	175.6±5.06		
	convex	160.57±5.04	165±4.57	164±4.65	163.19±4.45		
	straight	164.4±5.11	169.7±5.02	168.28±5.01	167.46±5.03		
	Mean	166.65±5.05	170.26±5.01	169.36±4.60		0.000	0.000
Total facial convexity angle (NPrnPg)	concave	145.5±4.47	144.5±4.41	146±4.21	145.3±4.40		
	convex	135.38±4.37	136.5±4.7	137.8±4.3	136.56±4.2		
	straight	138±4.38	140.86±4.37	139.65±4.35	139.5±4.3		
	Mean	139.62±4.3	140.62±4.4	141.15±4.3		0.000	0.000
Nasofrontal angle (GNNd)	concave	139±1.78	137.8±1.47	135.8±1.55	137.53±1.5		
	convex	135.09±1.46	137±1.21	134.91±1.53	135.66±1.45		
	straight	135.2±1.49	135.08±1.44	135.88±1.47	135.38±1.46		
	Mean	136.43±1.47	136.63±1.3	135.53±1.5		0.038	0.024
Nasolabial angle (CmSnLs)	concave	110±10.44	101.1±11.5	102±11.65	104.36±11.2		
	convex	106.96±11.4	106±10.85	107.2±11.5	106.72±11.4		
	straight	106.61±11.3	106.98±11.45	106.97±11.4	106.85±11.33		
	Mean	107.85±11.5	104.69±11.4	105.39±11.5		0.008	0.010
Mentolabial angle (LiSmPg)	concave	130±11.53	135.8±12.4	130.4±11.99	132.06±11.52		
	convex	136.6±12.38	140±12.95	139.53±12.33	138.71±12.2		
	straight	137.25±12.48	136.6±12.34	136.62±12.37	136.82±12.4		
	Mean	134.61±12.04	137.46±12.24	135.5±12.24		0.032	0.024

Projection of upper lip to chin (NPg/ NLs)	concave	16±2.16	7.9±2.1	8.4±1.98	10.76±2.2		
	convex	7.14±2.09	12±2.24	11.07±2.08	10.07±2.1		
	straight	10.4±2.13	9.52±2.1	9.76±2.08	9.89±2.1		
	Mean	11.18±2.12	9.8±2.12	9.74±2.08		0.010	0.000
Projection of lower lip to chin (NPg/ NLi)	concave	4±2.18	4.3±4.12	4.8±2.06	4.36±2.04		
	convex	7±3.9	8±2.29	7.62±3.95	7.54±3.8		
	straight	6±1.95	5.74±3.92	5.3±3.92	5.68±3.9		
	Mean	5.6±2.4	6.01±3.9	5.9±3.9		0.011	0.000
Nasal tip angle (NPrnCm)	concave	58±9.59	57.4±8.61	61±8.21	58.8±8.6		
	convex	61.66±8.48	63±5.51	58.83±8.34	61.16±8.3		
	straight	59.6±8.23	60.19±8.42	58.5±8.46	59.43±8.4		
	Mean	59.7±8.2	60.19±8.4	59.44±8.4		0.009	0.008
Nasomental angle (NPrn/NPg)	concave	20.5±3.3	21.1±3.43	20.6±3.08	20.73±3.4		
	convex	27.21±3.53	27.5±3.32	25.62±3.39	26.77±3.5		
	straight	25.2±3.46	23.73±3.34	23.1±3.53	24.01±3.34		
	Mean	24.3±3.4	24.11±3.34	23.1±3.3		0.036	0.032
Upper lip angle (SnLs/SnPg)	concave	18±8.09	25.1±8.43	26.2±8.05	23.1±8.1		
	convex	28.48±8.38	29.5±8.73	27.7±8.44	28.56±8.4		
	straight	25.6±8.46	25.68±8.4	24.35±8.39	25.21±8.3		
	Mean	24.02±8.3	26.76±8.4	26.06±8.2		0.045	0.009

Significant correlation to study variable in facial convexity angle and Total facial convexity angle. ($p<0.005$)***

Discussion

DISCUSSION

Considerations of facial aesthetics always have been an inseparable part of the principles and practice of orthodontics. The early orthodontists applied an artistic ideal of dental occlusion as their model in correcting irregularities of the teeth and jaws in young growing patients. Over the years clinical concepts of facial aesthetics have gradually shifted from the application of cultural, ethnic based norms to the use of quantitative soft tissue diagnostic evaluations.

Harmonious facial aesthetics and functional occlusion have long been recognized as two of the goals of orthodontic treatment. The introduction of cephalometric radiography in orthodontic diagnosis by Broadbent in 1931 inadvertently shifted the specialty's attention from the facial soft tissues to skeletal structures. The soft tissue profile has been studied from lateral cephalometric radiographs, under the assumption that the form of soft tissue outline largely determines the aesthetics of the face.

Cephalometric radiography is accurate in evaluation, but radiation hazards are main conceren. Literature[42,4,39,42] compared cephalometry with photometry and showed promising results. The recent surgent of facial photography, and its use in soft tissue analysis have eliminated worries about radiation exposure. Moreover, the photometry method is considered to be much easier for children to cope with when compared to cephalometrics.[8]

According to different authours,[9-10] the sagittal relationships of the dental arches were described according to terminal plane relationship of the maxillary and mandibular primary second molars and the relationship of the primary canine teeth. Literature[43] show, that patients with similar molar relation have highly dissimilar skeletal and soft tissue relationship. It is an important fact to recognize, because when the dentition is mutilated or a malocclusion exists, the facial profile may directly influence the direction of the treatment. It may be necessary to treat similar malocclusions in contrasting manners due to the soft tissue profile.

However, despite numerous studies dealing with soft tissue profiles in adolescence and adults, the literature includes few studies with children under 6 years of age. Identifying the characteristics soft tissue in children under 6 years of age could provide useful prognostic and diagnostic criteria. From a clinical point of view, it is often too early to begin an orthodontic treatment for this age group, but the quantification of soft tissue analysis at this age will be useful from a prognostic and diagnostic point of view.[8]

Keeping the above facts in mind, the present study was done to assess the correlation between the molar occlusal types with the soft tissue profile of 4 to 5 year old children using photometry. The age range of 4 to 5 years was selected in order to eliminate children with incomplete primary dentition as well as those with mixed dentition.

Precautions are taken to standardize the methodology, in which left profile photographs of children are made, in natural head position, with maximum intercuspation and lips at rest.[4,6,8,39] Images are transferred to a computer using Photoshop 7.0 (Acrobat Systems Inc, Minnesota, United states). The soft tissue landmarks are marked and 10 angular measurements are made and correlated with the molar relationship registered from the study models.

Soft tissue analysis relies on angular, linear or planar measurements or combination of the three.[3] Angular photometric analyses require no reference planes and angular measurements are not affected by photographic enlargement.[26] Hence certain angular and linear measurements are assessed as given by various authors.[27,44-46]

In this present study, the angular measurements and molar occlusal type are analysed among 242 children of 4 years and 232 children of 5 year age group with mean age of 4.5 years. The study group contains 220 males and 254 females. There is no significant difference between age and sex distribution of the study sample ($p > 0.005$).

The present study, found, flush terminal plane (46.6%) as the more prevalent second primary molar occlusal type followed distal step (33.5%), and mesial step (19.8%) being the least and the straight profile (54.21%) was more prevalent soft tissue profile, followed by convex (42.9%) and least being the concave (3.5%).

The children with flush terminal plane predominantly had straight profile (72.3%), followed by convex (25.3%) and with minimal of concave (2.26%). Similarly among distal step, predominantly had convex profile (89.3%), followed by straight (9.4%), and with minimal of concave (1.25%). Incase of mesial step, the predominant was straight (87.23%), followed by concave (10.63%), and minimal of convex (2.12%) and there was significant relation ($p < 0.005$) between molar occlusal type and facial profile. Similar findings were observed by Dalci et al in flush terminal plane and mesial step, but varied in distal step, where straight profile was more prevalent in 3 to 5 year old children.[8]

According to Bishara et al, individuals with a flush terminal plane relationship will progress to class I/class II/ end-to-end occlusion. In individuals with mesial step, it may become either class I or class II or class III. In indivuals with distal step it becomes class II in permanent dentition. Considering that growth and development peak well after the age of 5 years, only 3.5% children in the study had concave profiles.[3]

There is no significant difference in the prevalence of facial profile between 4 and 5 years age group.

There is significant difference in the prevalence of facial profile between gender with more of straight profile in girls and convex profile in boys.(p=0.001)[***] similar to findings of Subtenly who showed gender dimorphism.[47]

In the present study, the mean value for the facial convexity angle was 165.43° and total facial convexity angle was 138.50°, similar to the findings of Dalci et al (165.3° and146.2° in 3-5 year old)[8] Subtenly et al (163ºand 139.1º in 4 years and in 5 years,162.3º and 138.5º)[46,47] and higher to the findings of Dimaggio et al (157.80° in 6 year)[4] and Anic-Milosevic et al (168º±5º)[27] Arnett and Bregman (169.4º±3.2º)[24,25] Bhandari et al (167.89º±3.38º)[33] and Riverio (168º)[7] in adult population and they stated that as age increases the facial convexity angle and total facial convexity angle changes. In the previous studies the reference points considered for convexity angle, (glabella or nasion),varied with different authors[4,8,27] whereas in the present study for facial convexity angle, N-Prn-Pg and total facial convexity angle, G-Sn-Pg were considered as the reference points which where according to Bandari et al study.[33]

There was no difference observed in mean facial convexity angle and total facial convexity angle with gender, similar to the findings of Dalci et al.[8]

There was significant difference in total facial convexity angle (p=0.000)[***] between 4 and 5 year old children and no significant difference in facial convexity angle, similar to the findings of Dalci et al[8], Subtenly et al,[47,48] Chaconas et al,[49] who stated that face is highly convex in 3years when compared to 5 years can be explained by the forward growth of the nose with age as explained by Chaconas et al.[49]

The skeletal profile becomes less convex over the years and the convexity of the soft tissues profile increases by cephalocaudal growth gradient. As a result of the growth in length in younger patients the lower lip is more expressed in relation to the upper. Subtenly, Chaconas, Bartroff have shown that facial convexity angle remains relatively stable after the age of 6 years[47-50] and contrast to these studies, a longitudinal study by Bishara showed that facial convexity increases significantly between the ages of 5 and 9 and remains relatively stable from age 9 to age 13 years and then decreases from age 13 to adulthood.[3] Hence early diagnosis helps in necessary intervention at appropriate age.

The study found significant correlation between soft tissue facial convexity angle and total facial convexity angle to primary second molar occlusion type. ($p = 0.000$)*** The mean facial convexity angle and total facial convexity angle decreasing from 170.28º and 141.45º respectively among children with mesial step occlusions to 161.11º and 135.76º, respectively among those with distal step occlusions. Although straight profile was the most common type of FCA and TFCA regardless of primary second molar relationship, higher rates of distal- step molar relationships (71%) were found among children with convex profiles (both FCA and TFCA) when compared to those with straight and concave profiles, whereas higher rates of mesial-step molar relationships (58.8%) were found among children with concave profiles (both FCA and TFCA) when compared to those with convex and straight profiles. These findings indicate that facial traits have an effect on occlusion, even at very young ages (3-5years).[8]

. In the present study found the mean of nasofrontal angle was 135.08º, which was slightly lower to the findings of Bhandari et al (138º±3.38) in Himachali adult population,[33] Anic milsovic et al (139º±6.35) in crotian adult population,[27] who is having more prominent nose.

There was no significant difference observed in the mean nasofrontal angle between gender and between age groups, which is similar to the findings of Epker,[51] and contradictory to the findings of Bhandari et al (p=0.080),[33] and Anic milsovic et al (p=0.030),[27] who observed gender dimorphism in adult population.

The study found no significant correlation between nasofrontal angle to molar occlusal type and soft tissue profile.

The mean nasolabial angle (Cm-Sn-Ls) of the study group is 106.974º, falls within the cosmetically desirable range of 102º±8.[24,25] This is an important angle in assessing the upper lip position and used as part of the extraction decision.

In the present study, the nasolabial angle was most significant angular variable of the soft tissue profiles between the genders. There is significant difference ($p<0.005$), seen between gender suggesting girls have protrusive upper and lower lip compared to boys, similar to Sforza et al (4 to 5 years old boys was 123.41° and for girls was 131.63°)[52], Anic milsovic ($p=0.018$),[27] Bhandari ($p=0.001$)[33] who showed gender dimorphism and contradictory to the findings of Legan and Burrstone who found there was no gender difference for this angle.[45,53]

The study found no significant correlation between nasolabial angle to occlusal type and soft tissue profile.

In the present study, the mean of mentolabial angle was 136.616, which was higher than Bandari et al (129.76°±4.33),[33] Anic Milsovic et al (129°),[27] Burstone (122°).[45] This indicates that the study population have a shallow mentolabial sulci.

The mentolabial angle tends to be influenced with uprighting of incisors, however there is no difference found in the mentolabial angle with respect to age or gender.

The study found no significant correlation between the mentolabial angle to molar occlusal type and soft tissue facial profile

In the present study, the mean value of projection of upper lip to chin was 10.424° and projection of lower lip to chin was 6.236°, suggesting that the study population has more protrusive upper and lower lip. These findings are contradictory to Bhandari et al (8.11° and 3.40°),[33] Anic milsovic el al (6.98° and 3.27°)[27] in adult population.

There was no significant difference between the mean projection of upper lip to chin, lower lip to chin with age and gender, which is similar to findings of Anic milsovic,[27] contradictory to the findings of Bhandari et al,[33] where gender dimorphism was seen .

The study found no significant correlation between the projection of upper lip and lower lip to chin and the primary second molar occlusal type, whereas significant correlation observed with the soft tissue facial profile angles. Increase in convexity of the soft tissue profile is explained by the greater increase in thickness of the soft tissue in the area of maxilla than in the area of the forehead or mandible.[27]

In the present study the mean value of nasal tip angle (N-Prn-Cm) was 60.339º is within the acceptable range of 60º to 80º as recommended by Lines,[54] McNamara,[55] which is similar to the findings of Anic milsovisc[27] and lower than the findings of Bhandari et al (87.73º).[33]

The study found significant difference in the nasal tip angle between age, ($p = 0.000$)[***] and is interpreted as the evidence of the forward growth of the nose. No significant difference in the nasal tip angle between gender, which is contradictory to the findings of Bhandari et al, Anic milsovic et al, who showed gender dimorphism.[27,33]

The study found no correlation of nasal tip angle to occlusal type and soft tissue profile.

In the present study, the mean value of nasomental angle was 25.031º, falls under aesthetic range (20º to 30º) as recommended by Lines et al,[54] and is lesser than the findings of Bhandari et al (33.22º), Anic Milsovic et al (29.5º), in adult population.[27,33]

No significant difference is found between the nasomental angle with age and gender. This is contradictory to the findings of Bhandari et al, Anic Milsovic at al who showed gender dimorphism.[27,33]

The study found no significant correlation between nasomental angle to occlusal type or facial profile.

In the present study, the mean upper lip angle was 26.651 indicating protruding upper lip which is higher than the findings of Bandarai et al (12.73º), Anic milsovic (12.90º), whose findings are based on adult population.[27,33]

No significant difference is found between the mean upper lip angle with age and gender, is contradictory to the findings of Bhandari et al, Anic milsovic at al who showed gender dimorphism.[27,33]

The study found no significant correlation between upper lip angle to occlusal type and soft tissue facial profile.

The study findings shows that no significant difference in the sample distribution between the age or gender. The flush terminal plane is more prevalent primary molar occlusal type followed by distal step and mesial step being the least. Among facial profile, the straight profile is more prevalent, followed by convex and least being the concave Significant correlation is seen between molar occlusal type and soft tissue facial profile angles (facial convexity angle and total facial convexity angle). There is significant correlation between the soft tissue profile and projection of upper lip and lower lip to chin. Significant difference is seen in nasolabial angle between boys and girls. Significant difference occurs with age in total facial convexity angle and nasal tip angle.

This study is an initiative to establish preliminary data to the Chennai children and an early attempt to establish value for this young population where primary dentition is complete and permanent dentition is yet to develop and to find correlation between the primary second molar occlusal type and facial profile. However some of these angles and profile may change with growth but early diagnosis and follow up helps in early intervention and maintainace of esthetics in these children.

Conclusion

CONCLUSION

In the present study, the mean normative values of the study variables with standard deviation and 95% confidence interval were determined. Based on the observations of the study, the following mean normative values of the study variables in the profile view for these children was determined.

- Facial convexity angle –165.85º
- Total facial convexity angle –138.5º
- Nasofrontal angle-135.08º
- Nasolabial angle –105.97º
- Mentolabial angle –136.61º
- Projection of upper lip to chin-10.42º
- Projection of lower lip to chin -6.23º
- Nasal tip angle – 60.33º
- Nasomental angle -25.03º
- Upper lip angle -26.65º

It can be further concluded from the present study that,

- Samples are equidistributed between boys and girls and between 4 years and 5 years.
- The flush terminal plane is more prevalent primary second molar occlusal type followed by distal step and mesial step being the least.

- The straight profile is more prevalent soft tissue facial profile followed by convex and least being the concave.
- Significant difference is seen in nasolabial angle between boys and girls. ($p<0.005$)*** The facial convexity angle, total facial convexity angle, nasofrontal angle, mentolabial angle, projection of upper lip to chin, lower lip to chin, nasal tip angle, nasomental angle, upper lip angle showed no significant difference between boys and girls ($p> 0.005$)
- There is significant correlation between the soft tissue profile and projection of upper lip and lower lip to chin.
- Total facial convexity angle, nasal tip angle showed significant difference between 4 and 5 year age group children ($p=0.000$)***
- All the other parameters were found to be statistically insignificant between 4 and 5 year age group children.($p>0.005$)
- Significant correlation is seen between molar occlusal type and soft tissue facial profile. ($p= 0.000$)***
- Significant correlation is seen between molar occlusal type and soft tissue facial profile angles. (facial convexity angle $p=0.000$ and total facial convexity angle $p=0.000$)***

Application of photographic analysis in daily clinical practice is easy for children to cope up at this young age group, inexpensive method, and no risk of radiation in the crucial growing period. The present study used a two dimensional photogrammetric method, hence was a two dimensional representation of three dimensional surfaces. More recently, 3D soft tissue laser scanners (eg. 3D-MD) and software (eg: Dolphin) have been developed to provide 3D soft tissue analysis. 3D stereo photogrammetry, though very expensive, difficult in image transparency and inability to measure bony landmarks, can be used for quantitative longitudinal assessment in preschool children due to its millisecond fast image capture, archival capabilities, high resolution and no exposure to ionizing radiations.

This is a cross-sectional study. For accurate prediction of dentofacial growth and development, further longitudinal studies are required, wherein the influence of genetic makeup, environmental exposures and other unmeasured characteristics that tend to persist over time can be evaluated. Longitudinal evaluation of soft tissue facial dimensions will also inform the clinician about the growth, growth spurt changes between gender and treatment changes.

An accurate quantitative evaluation of facial soft tissue dimensions of an individual patient by comparison to a set of normative values will provide an insight into underlying orthodontic pathologic process or create a basis for treatment planning.

Summary

SUMMARY

The present study was a cross-sectional study conducted at the Department of Paedodontics, Ragas dental college, Chennai, to correlate the soft tissue facial profile with molar occlusal type through photometric analysis in 4-5 year old children.

The study period was from December 2015 to October 2016. Permission from the Institutional Ethical committee was obtained prior to the study. 600 children were screened, out of which 475 children were selected who met the inclusion criteria and written consent from the parents of the participating children were obtained.

Lateral profile photographs were taken based on the method recommended by Gomes et al,[39] with Nikon D5200 SLR camera mounted on a tripod stand. The subject were instructed to place his/her teeth in occlusion and to keep the lips relaxed without exerting any undue force. All the measurements were made in the Acrobat Photoshop software.

Impressions were made with disposable dual impression trays and putty material. Casts were made to study the primary molar occlusal type.

The data were tabulated using Microsoft Excel 2016. Prevalence of molar occlusal type, soft tissue profile and soft tissue angulations were recorded and correlated with age, gender. Gender and age difference between the variables were and correlations were statically analyzed.

The mean normative values of the study variables in the profile view for these children were, Facial convexity angle (165.85º),Total facial convexity angle (138.5º), Nasofrontal angle (135.08º), Nasolabial angle (105.97º), Mentolabial angle (136.61º), Projection of upper lip to chin (10.42º), Projection of lower lip to chin (6.23º), Nasal tip angle (60.33º), Nasomental angle (25.03º),Upper lip angle (26.65º).

The flush terminal plane is more prevalent primary second molar occlusal type followed by distal step and mesial step being the least. The straight profile is more prevalent soft tissue facial profile followed by convex and least being the concave.

Significant difference is seen in nasolabial angle between boys and girls. ($p<0.005$)*** There is significant correlation between the soft tissue profile and projection of upper lip and lower lip to chin. Total facial convexity angle, nasal tip angle showed significant difference between4 and 5 year age group children. ($p=0.000$)***

Significant correlation is seen between molar occlusal type and soft tissue facial profile. ($p=0.000$)*** Significant correlation is seen between molar occlusal type and soft tissue facial profile angles. (facial convexity angle $p=0.000$ and total facial convexity angle $p=0.000$)***

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Annexures

ANNEXURE I

Screening Form

Name: **Number:**

Age: **Date:**

Gender:

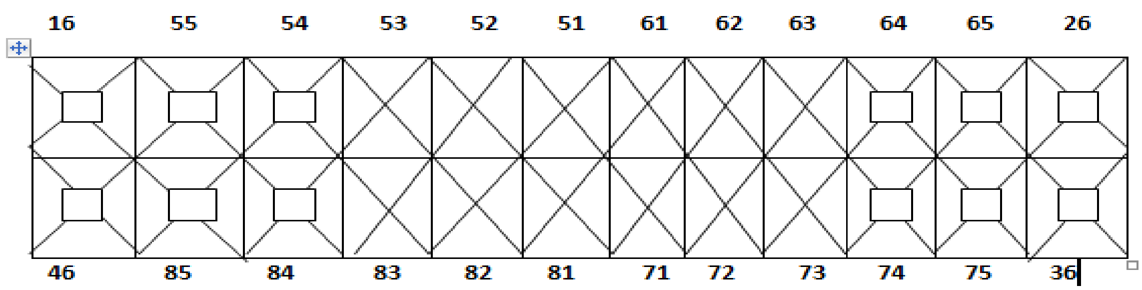
Chief complaint:

History:

Primary Molar Occlusal type : Flush/ Mesial step / Distal step

Facial Soft tissue Profile: Straight/ Convex/ Concave

Dmfs:



Diagnosis:

Treatment plan:

ANNEXURE-II

CONSENT FORM

I____________________________, the parent/guardian of___________________________, herby give consent for the participation of my son/daughter in the study titled **"CORRELATION OF PRIMARY SECOND MOLAR OCCLUSAL TYPE TO SOFT TISSUE FACIAL PROFILE USING PHOTOMETRIC ANALYSIS"** being conducted by **Dr. S. BHUVANESSWARI**, a postgraduate student of Ragas dental college and hospital, Chennai. Under the guidance of **Dr. M. JAYANTHI,** Prof and Head, department of Paedodontics and preventive dentistry. I have been clearly informed about the procedure/techniques of the study and I voluntarily, unconditionally, freely give my consent for the active participation of my child without any form of pressure and in a mentally and conscious state.

Signature of the investigating doctor

Signature of the Patient's parent / Guardian.

ANNEXURE-III

சிகிச்சை ஒப்புதல் படிவம்

__________________________ஆகிய நான் ___________________ என்கிற

(பெற்றோரின்பெயர்) *(குழந்தையின்பெயர், வயது)*

என்குழந்தையின் வாய் / பல் பகுதியை ஆராய்ந்து பார்க்க ஒப்புதல் அளிக்கிறேன். மேலும், இந்த ஆராய்ச்யினை மேற்கொள்வதினால் விளையக்கூடிய நன்மைகளையும், அதனால் விளையக்கூடிய அசௌகரியங்களையும் அறியப் பெற்றப்பின், நான் எவ்வித அச்சமுமின்றி தன்னிச்சையாகவும், முழுமனதுடன் என்னுடைய சம்மதத்தினை அளிக்கிறேன்.

கையொப்பம்:

தேதி, இடம்:

சாட்சிகள்;

ANNEXURE - IV

RAGAS DENTAL COLLEGE & HOSPITAL
(Unit of Ragas Educational Society)
Recognized by the Dental Council of India, New Delhi
Affiliated to The Tamilnadu Dr. M.G.R. Medical University, Chennai
2/102, East Coast Road, Uthandi, Chennai - 600 119. INDIA.
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TO WHOM SO EVER IT MAY CONCERN

Date: 22-06-2015
Place: Chennai

From
The Institutional Review Board,
Ragas Dental College & Hospital,
Uthandi,
Chennai – 600119.

The thesis topic "**CORRELATION OF PRIMARY SECOND MOLAR OCCLUSAL TYPE TO SOFT TISSUE FACIAL PROFILE USING PHOTOMETRIC ANALYSIS"** submitted by **Dr.S.BHUVANESSWARI** has been approved by the Institutional Review Board of Ragas Dental College & Hospital on 22nd June, 2015.

(Dr. N.S. AZHAGARASAN, M.D.S.,)
Secretary, Institutional Review Board,
Head of the Institution,
Ragas Dental College & Hospital,
Uthandi,
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